



Air Force Research Laboratory|AFRL

Science and Technology for Tomorrow's Air and Space Force

Success Story

MOBIES TECHNOLOGY PARTICIPATES IN AUTOMATED BUS CONTROL DEMONSTRATION



MoBIES—“Take the Bus and Leave the Driving to Us.” The California Department of Transportation (Caltrans) did just that recently when they took MoBIES (model-based integration of embedded software) on a test-drive to display automated vehicle control technologies. They accomplished this by executing cooperative multivehicle, highway-speed maneuvers with several specialized mass transit buses on a 7-mile stretch of Interstate 15 in San Diego, California.

Several branches of the Information Directorate are participating in MoBIES, a Defense Advanced Research Projects Agency Information Exploitation Office-sponsored program that is developing application-independent tool technologies for reusable component-based software for complex, real-time, embedded systems. MoBIES technologies will benefit the Air Force due to their ability to counter increasing design time, cost, and risks associated with the growing complexity of embedded software for modern weapon systems.



Air Force Research Laboratory
Wright-Patterson AFB OH

Accomplishment

During the demonstration, Caltrans transit buses employed an experimental cooperative adaptive cruise control (CACC) system to automatically maintain a platoon formation at highway speed on I-15's reversible commuter lanes. During the testing and demonstrations, the lanes were closed to regular traffic.

The demonstration hardware included two 40 ft long compressed natural gas buses and one 60 ft long diesel-fueled bus. The buses were equipped with actuators (brake and steering) and sensors (accelerometers, gyroscope, magnetometers, radar, and lidar). In addition, a wireless system was installed to allow vehicle-to-vehicle communications.

Onboard embedded software that controlled the vehicles' CACC system utilized MoBIES technology during the demonstration. The CACC system differs from traditional cruise control systems because the lead vehicle communicates its state information to a following vehicle. The following vehicle uses this information along with its own sensors to maintain a specified distance between itself and the lead vehicle. The development time for the entire supervisory portion of the longitudinal controller proved to be significantly shorter than previous demonstrations using the MoBIES technology.

Background

The MoBIES program has 14 contractors developing embedded software design tools and 3 open experimental platform contractors. The directorate's Advanced Architecture and Integration Branch, along with the University of California, Berkeley, and Caltrans, participated in this demonstration.

During the software development, several different levels of vehicle models were considered. Three simplified versions of the model were produced for formal verification purposes and challenge problems for the MoBIES embedded software design tools. The three versions included a model with linear plant and controller, a model with nonlinear plant and controller, and one, with nonlinear plant and controller, that requires the use of a look-up table.

Additional information

To receive more information about this or other activities in the Air Force Research Laboratory, contact TECH CONNECT, AFRL/XPTC, (800) 203-6451 and you will be directed to the appropriate laboratory expert. (04-IF-06)